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CHARACTERIZING THE PSYCHOLOGICAL STATE PRODUCED BY LSD.

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THE DEVELOPMENT AND COMPONENTS OF LYSERGIC ACID DIETHYLAMIDE (LSD) PRODUCED PSYCHOLOGICAL STATES ARE INVESTIGATED. THE SUBJECTS WERE PAID VOLUNTEERS FROM THE PATUXENT INSTITUTION, A TREATMENT CENTER FOR EMOTIONALLY UNSTABLE CRIMINAL OFFENDERS. IN ONE STUDY, GROUPS OF 23 SUBJECTS RECEIVED LSD, AN AMPHETAMINE, OR A PLACEBO. IN THE SECOND STUDY, 11 SUBJECTS RECEIVED CHLOROPROMAZINE. ADMINISTERED DOSES WERE MODEST. TESTS, REPEATED AT INTERVALS THROUGH THE DAY, CONSISTED OF SOMATIC MEASUREMENTS, AN ADAPTATION OF THE CLYDE MOOD SCALE, A SPECIALLY DEVELOPED SUBJECTIVE DRUG EFFECTS QUESTIONNAIRE, AND A NEW PICTURE RATING TECHNIQUE. AN EUPHORIC STATE WAS APPARENT IN SOME INDIVIDUALS, A DYSPHORIC STATE CHARACTERIZED SUBJECTS WHO WERE JITTERY, FEARED LOSS OF CONTROL, AND HAD IMPAIRED COGNITION. INDIVIDUALS IN AN AMBIVALENT STATE EXPERIENCED STRONG OPPOSING EMOTIONS AND PERCEPTIONS. THE MOST STRIKING OBSERVED EFFECTS WERE THE INTENSE EMOTIONS THESE SUBJECTS EXPERIENCED WITHOUT EXTERNAL STIMULUS. ALL LSD SUBJECTS EXPERIENCED PHENOMENA WHICH DISTINGUISHED THEM FROM PLACEBO AND AMPHETAMINE SUBJECTS. VARIOUS LSD PATTERNS PROBABLY RESULT FROM NON-DRUG FACTORS. THIS RESEARCH MAY CONTRIBUTE TO AN UNDERSTANDING OF HOW MORE PROFOUND LSD STATES BEGIN, BUT GENERALIZATIONS MUST BE LIMITED BECAUSE OF THE TYPE OF SUBJECTS USED. THIS ARTICLE IS A PREPRINT TO APPEAR IN THE JOURNAL OF ABNORMAL PSYCHOLOGY. (PR)

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CHARACTERIZING THE PSYCHOLOGICAL STATE PRODUCED BY LSD

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Characterizing the Psychological State Produced by LSD[1]

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There has been a great deal of interest over the years in LSD and a very large volume of research on its psychological effects. The literature ranges from clinical descriptions of the psychological states produced (e.g., DeShon, Rinkel, & Solomon, 1953; Hoch, Cattell, & Pennes, 1952; Savage, 1952), through more systematic and objective studies of the effects of LSD on such aspects of functioning as cognition (Aronson, Waterman, & Klee, 1962; Levine, Abramson, Kaufman, & Markham, 1965; Silverstein & Klee, 1958), perception (Aronson, Silverstein & Klee, 1959; Krus, Wapner, Freeman & Casey, 1963; Leibert, Wapner, & Werner, 1957), and psychomotor performance (Abramson, Jarvik, & Hirsch, 1955; Kornetsky, 1960; Krus & Wapner, 1962; Landis & Clausen, 1954). Several researchers have also begun to look more systematically at the nature of the subjective experience itself (Abramson, Jarvik, Kaufman, Kornetsky, Levine, & Wagner, 1955; Linton & Lange, 1962).

Despite this volume of research, however, the total experience produced by LSD still eludes complete comprehension. Descriptions of the state have ranged from that of Hofman and the earlier investigators (e.g., Stoll, 1947; Rinkel, DeShon, Hyde, & Solomon, 1952), in which the toxic psychotic or schizophrenic-like qualities of the experience were emphasized, to the more recent reports of mystical or transcendental states (Savage, Terrill & Jackson, 1962). The range of states which are described are partly a function of dosage, but a great deal of influence has also been attributed to the role of non-drug factors in determining the quality of the experience (Cole & Katz, 1964; DiMascio & Rinkel, 1963; Hyde, 1958; Unger,

1963). The personality of the subject, his preparation or his set prior to the experiment, as well as the setting in which the drug is given, are all presumed to play a role in shaping a subject's LSD experience. Thus, the problems of determining the actual effects of the drug itself and of unravelling the bases for these very unusual states are further complicated. The influence of these diverse factors and the failure to control them adequately in much of this research has led to the current confusion concerning the effects produced by LSD.

The first step in attempting to understand the nature of the experience should be the objective delineation of the psychological components, with special emphasis on the effects of the drug on the emotions. The available research literature does not indicate that the psychological states which are produced have been as carefully and unemotionally described or analyzed as they could be, or that the appropriate methods for their study have generally been applied. For example, the drug was usually not tested in a situation in which suggestion and previous knowledge of effects were controlled and, although contrasted frequently with a placebo, its specificity has generally not been examined by comparing its effects with that of other similarly acting drugs, e.g., drugs which also elevate mood. Further, the attempt to understand how a drug is capable of producing mystical states and profound alterations in consciousness appears to require an experimental approach which provides the conditions under which the early stages and the development of such states could be studied.

The present studies were designed to investigate, with the use of appropriate and adequate controls, the development and components of LSD-produced psychological states. A major problem was that of selecting and developing techniques for

measuring these states.

If a drug results in unusual emotional, perceptual, and cognitive effects - effects which are not familiar - then it is likely that our traditional techniques will be limited in helping to understand or to delineate these effects. An early review of the use of standard psychological procedures in the study of LSD is instructive here (Katz, 1959); little new information was provided by the standard techniques despite the fact that it was clear to all observers in research of this type that the drug was producing some very strange effects. Except for the work at the University of Maryland Psychiatric Institute (Klee, 1963), little has been added to the information in this area in recent years. Further, the conventional approaches to quantifying the subjective aspects of drug effects, i.e., the usual symptom questionnaires and the usual mood scales, did not speak the language of these effects, except in those cases where special purpose questionnaires were constructed for use in LSD studies (Abramson, Jarvik, Kaufman, Kornetsky, Levine, & Wagner, 1955; Linton & Langs, 1962).

The conventional methodologic approach to the study of drug effects can, however, be broadened and improved. The present authors have tried to do this by taking advantage of the attempts of others to articulate the effects of LSD-type drugs, by trying to describe and to document what they have observed themselves, and by applying new methods to the study of the perceptual and verbal behavioral components in order to provide a more complete picture of the psychological states which are produced.

Method

In order to accomplish the aims of the research, it was extremely important to control for the influence of non-drug factors and to provide a situation in

which the development of the LSD-state could be adequately studied. Because of the special difficulties in controlling for such factors in LSD research, it was necessary to develop an experimental situation in which (1) the subjects were not familiar with the effects of the drug; (2) the drug was one of several drugs administered to different subjects, drugs which have very different effects, e.g., stimulation, sedation, etc., so that a given subject could not predict which he would be receiving; (3) a comfortable, "safe" setting was provided but the preparation was neutral; (4) the administered drug dosages were modest, sufficient in size to permit the characteristic effects of the drug to appear but not so overwhelming that it was not possible to apply a broad range of psychological methods to their study.

Subjects

The two studies to be described took place at the Patuxent Institution, a treatment center in Maryland for emotionally unstable criminal offenders. Subjects were paid volunteers of at least dull-normal intelligence (WAIS IQ range of 80-125, average IQ 102) and of sixth grade educational level or above. All were screened psychiatrically to eliminate potentially psychotic or severely disturbed individuals. The subjects were between the ages of 21 and 40, and were sampled from the more "normal" segment of the prison population. Although the sample is similar to those used in many basic studies of drug effects, generalizations from the results have to be qualified somewhat by the nature of the population. There is obviously no ideal population for delineating the psychological effects of drugs; the members of this particular group were selected because they did not evidence any severe psychiatric disturbance and because of their lack of familiarity with the expected effects of LSD.

Design

In the first study, a subject, once he was screened and had volunteered for the study, was randomly assigned to one of four treatments, 50 λ of LSD, 15 mgs. of amphetamine, 50 mgs. of chlorpromazine,[2] and placebo. The conditions were double-blind, so that neither the subject nor the several observers knew initially which treatment had been administered to a particular subject, although the observers knew which drugs were involved in the study. The second study was similar to the first, but the chlorpromazine condition was eliminated and there were some revisions of methodology based on experience from the first study. In the first study, there were 11 subjects in each of the 4 treatment groups; in the second study, there were 12 subjects in each of the 3 treatment groups.

Procedure and Experimental Setting

Following screening, all potential subjects were interviewed by the project coordinator, a psychologist, who instructed them as to the nature of the study. During this interview, subjects had the choice of volunteering or not volunteering for the study. They were told that the purpose of the study was to investigate the physical and psychological effects of several drugs, that the drugs were not new, but that more information was desired about their specific effects. It was emphasized that the drugs were safe under the dosages administered, that a physician would be checking on their condition throughout the day, and that they would stay in the hospital for routine observation the night after the drug study.

It was explained that the effects of the various drugs would range from mild to moderately strong depending upon the drug and how each person reacted to the drug. Also, subjects were informed, "Some effects might be pleasant, others

might be uncomfortable, and other effects might be quite different than you've had before." In the course of the interview, subjects were encouraged to ask questions about the study and to tell the coordinator what they had heard from previous study subjects. If a subject seemed to have specific expectations due to his knowledge of previous subjects' reactions, these were discussed with him, and he was told again that several different drugs were being used and that a number of different reactions were possible. The instructions were intended to reduce the likelihood that the subject would enter the experiment with any strong specific expectations.

Each subject was run on a separate day, and he was seen on that day by a psychiatrist, psychologist and the project coordinator. Before administration of the drug, the psychiatrist and psychologist administered the baseline physiological and psychological tests. The psychiatrist briefly reiterated the instructions previously given to the subject by the coordinator. All drugs were then administered orally. Amphetamine, chlorpromazine, and placebo were given in capsule form with water; in the case of LSD the drug was in the water and the capsules were placebo. An hour later, testing was resumed and was repeated at specified intervals throughout the day. Observational ratings were made of the subject's behavior by the coordinator, psychiatrist, and psychologist at specified times before and after drug administration.

It should be emphasized that, in the instructions given the subject, in the atmosphere of the room, and in the interactions of the staff with the subject, an attempt was made to create a pleasant, but neutral, atmosphere, in which specific expectations on the subject's part would be at a minimum. In order to avoid a strictly experimental, impersonal approach, the coordinator

kept in frequent touch with the subject throughout the day and tried to maintain a friendly, supportive relationship. The staff seemed successful in creating an unthreatening milieu, in which a subject felt free to report what he was experiencing. The majority of the subjects did not seem to have strong specific expectations and apparently believed that several different reactions were possible. No subject, either before or after participation in the study, indicated that he knew what drugs were being used.

Experimental Measures

In addition to the newly designed methods, several conventional procedures for measuring drug response were included in the study. The physiological measures used were standard for this type of experiment and included measures of blood pressure, body temperature, and pupillary changes. The results of these will not be reported here except to note that expected effects in these areas, particularly with regard to the characteristic pupillary changes associated with LSD, were clearly in evidence. A set of rating scales was used for recording observations of the subject's mood and behavior. This observational rating instrument was based on the format of the Clyde Mood Scale (Clyde, 1963) and included adjectives to represent the various factors of that Scale. In addition, several adjectives more specific to LSD effects (e.g., suspicious, mood inappropriate, mood fluctuating) were also included.

The new methods used for characterization of the psychological states produced by LSD will now be described.

Subjective Drug Effects Questionnaire (SDEQ). This instrument was developed to meet some of the shortcomings of subjective questionnaires previously used in drug research. The work with LSD has made it especially clear that (1) question-

naires have to include many new items involving unusual effects; (2) in order to determine the specificity of a particular drug, it is necessary to ask about effects not necessarily expected with that agent; (3) it is necessary to control for suggestion in the wording and in the manner in which the items are presented. The questionnaire which was developed for this study was designed to cover most possible changes in the thinking, feeling, perceptual and somatic areas which occur as a function of the effects of the major classes of drugs. In order to minimize the role of suggestion, the format of the questionnaire allowed a subject to endorse a particular effect and/or its opposite, and the order of presentation of these opposing effects was random.

Scales which describe the various facets of subjective response have been developed through an empirical clustering procedure, using a modification of the B-coefficient method (Holzinger & Harman, 1941).[3] The clusters are based on an analysis of the relationships among items when each subject was at his peak response (i.e., the time when he endorsed the largest total number of items on the questionnaire). In addition to the empirical scales, a number of scales were developed which are based on the hypothesized effects of various drugs, particularly LSD, derived from the authors' experience in pilot work and the experience of others. Examples of these are feelings of decreased control, ambivalence and euphoria-dysphoria. The empirical and a priori scales are presented in Table 1.[4]

Insert Table 1 about here

Picture Rating Technique. The second new method in the study is the Picture Rating Technique. This method has its antecedents in Bartlett's "method of

description" (1932) and is based on the hypothesis that internal changes in emotional state should result in changes in the individual's perception of the people around him. It was designed to assess the extent to which changes in mood are reflected in an individual's perception of the mood of others. The pictures were drawn from a larger group provided by Campbell (Campbell & Burwen, 1956). Three alternative sets of ten pictures were developed, balanced for age, sex, and the "likeability" of the faces in the photographs. The subject describes each photograph in a series on a list of adjectives, selected to cover basic mood factors that have been identified in previous psychometric studies of subjective mood states (Clyde, 1963; Nowlis & Nowlis, 1956). A scoring system has been developed which permits the profiling of the individual's perceptions of others, e.g., the extent to which others appear "friendly," "fearful," "sad," etc. Thus, the use of projective stimulus material was combined with a quantitative system for dealing with the dimensions of mood. Early studies, without drugs, indicated modest relationships between personality characteristics and the tendency to perceive in certain directions and between mood states as reported on the Clyde Mood Scale (Clyde, 1963) and perceived mood, e.g., between felt "jitteriness" and perceived "jitteriness." These findings support the basic validity of the approach.

Verbal and Vocal Behavior Scales. A third set of results to be reported are those derived from the application of a set of verbal and vocal behavior scales to the measurement of emotional change. In addition to using previously developed measures of verbal behavior (both temporal and content), a set of scales for rating changes in vocal qualities has been developed in the course of this research, based on the idea that changes in affect are reflected in

changes in the quality of the voice. Verbal samples taken before and during the drug experience were rated on a number of semantic-differential-type scales. The vocal aspects of speech were isolated for these ratings by the use of a filtering technique developed by Soskin (Soskin & Kauffman, 1961), in which frequencies above a particular point are greatly attenuated; this method eliminates the intelligibility of speech while retaining many voice characteristics. Each sample was rated by two research assistants with M.A. level training in psychology, and the scores used were the means of the ratings of these two raters. This method of rating vocal aspects of speech is discussed more fully in a paper by Waskow (in press).

Results

In the results to be reported, two somewhat distinct approaches have been applied to the analysis of the effects of LSD. The first is designed to delineate the specific subjective effects of LSD, by contrasting them with those which occur simply as a function of taking a drug (the placebo condition), and with those which occur with an agent which is similar to LSD with regard to elevating mood (i.e., amphetamine). This type of analysis cannot, however, delineate the qualitatively different psychological states which may be experienced by different individuals given the same drug. In the second type of analytic approach, an attempt is therefore made to identify the patterns of subjective response which are produced. This is followed by an analysis of the correlates of these "states" in the behavioral, perceptual and verbal behavior areas.

Analysis of Specific LSD Effects

For the first type of analysis, groups were compared on each scale of the Subjective Drug Effects Questionnaire taken at approximately 1½ to 2 hours post

drug, the time at which peak effects occurred for most subjects, and at 3½ hours post drug. This analysis is based on data from the first study. Differences between groups were analyzed by t-tests, except in cases of extreme heterogeneity of variance, where Fisher exact probability tests were substituted.

The picture one derives from comparing LSD with placebo on the Subjective Drug Effects Questionnaire, as in Table 2, is that of a drug which produces a

Insert Table 2 about here

diverse range of effects in the cognitive, somatic, perceptual, and feeling areas. These effects, rather than resulting in a consistent or rational pattern, instead produce a somewhat confusing mixture of positive and negative components. The subjects appear to feel relaxed and happy, but also jittery, tense, dizzy, excited, dreamlike, and giddy; to report their thinking impaired and their movements slowed, but their senses and perception sharpened; to perceive themselves as detached and their world unreal; to perceive others in an altered way; to feel that they have less control of themselves and to fear the loss of further control. They report a number of feelings to be occurring at approximately the same time which would appear to the rational observer as opposed and contradictory.

It is clear from this analysis that, if one were to evaluate LSD only on variables which were expected to occur with a stimulating or mood elevating agent, the drug would appear to be a euphoriant. In the broader framework provided by the Subjective Drug Effects Questionnaire, it appears to induce both euphoric and dysphoric effects. The comparison with amphetamine indicates that LSD can appear as stimulating as amphetamine, yet on those factors which are most associated with the energized, confident feeling of a good stimulant - e.g.,

feelings of increased control and improved cognition and psychomotor performance - amphetamine actually exceeds LSD.

In viewing the LSD effects which have been separated out in this analysis, it is a little hard to believe that they could be occurring together in the same people. Prior research on LSD has indicated that the effects are wavelike or cyclical, so that over the course of six to eight hours the mood of subjects may show considerable fluctuation. This wavelike nature of the effects would in part explain the above findings which appear to be contradictory. However, although the authors' observations confirmed the presence of wavelike effects in many subjects, it was also clear in the pilot work that certain of the opposing effects, particularly as regards mood, were actually occurring in the same people at the same time. On the basis of these observations, a way of quantifying this phenomenon from subjective reports was developed. The measure is called <u>ambivalence</u>: the extent to which feelings and experiences which are opposed to each other occur simultaneously or almost simultaneously in the subject.[5] Having observed and then demonstrated that this phenomenon does occur more frequently under LSD than under placebo or amphetamine, the authors view it as a major characteristic of the LSD experience. Its centrality as a phenomenon will become clearer in the discussion of the other study results.

Although most of the LSD subjects experienced, to some degree, the specific effects which have been described, it was obvious, also, that the subjects were not reacting uniformly with regard to their overall pattern of response to either LSD or amphetamine. The next question to be considered then was whether qualitatively different, but identifiable, subjective states were produced in different subjects, at that point in time when most subjects were at their peak response.

Also, in order to increase understanding of these psychological states and to define them more fully, correlates in other areas of functioning were analyzed. These included changes in observed behavior, in perception of others, and in speech.

Identification of Subjective States

From inspection of the data in the first study, different patterns of effects among the subjects were clearly discernible. In attempting to identify any general patterns which may be represented in the data, the three authors independently sorted the subjects into groups based on the similarity of their profiles of subjective effects. The authors concentrated on the pattern of relationships which existed among five general response scales on the SDEQ (cutting across somatic, feeling, cognitive, and control factors)[6] and used the specific scales as a secondary source of data for clarifying or confirming the existence of a particular pattern. It turned out that only one of the specific scales, a feeling scale, was given much weight in the pattern analysis. By focusing on the levels and the relationships among these six dimensions, it was possible to separate out three general patterns that occurred with LSD and two with amphetamine. The ease with which these groups could be distinguished is reflected in the fact that the three authors, although sorting cases independently, all came close to an identical breakdown of the subjects into the groups outlined here.

One group which stood out very clearly in the LSD condition was composed of subjects who scored quite high on the relaxed, happy, peaceful and improved cognition scales, but had relatively low scores on jittery, tense, fear of loss of control and impaired cognition. A group in the amphetamine condition reported a pattern similar to this LSD group, but with markedly lower scores on some of the

negatively-toned scales. Another, very small, group of LSD subjects had similarly high scores on the positively-toned scales, but scored very high on the negatively-toned scales as well. A third group (of both LSD and amphetamine subjects), although not quite as distinct as the others, had higher scores on the negatively-toned scales than they did on the positively-toned ones. Thus, three main patterns of response were found in the first study. Subjects in the second study were then categorized according to this breakdown with few problems. The placement of only one or two of these subjects was at all equivocal. All drug state comparisons are based on a combination of Study 1 and Study 2 subjects.

The three states produced by LSD are, then, a moderately euphoric state in which the extent of the relaxed, happy, peaceful and improved cognition scores exceeds the jittery, tense, fear of loss of control, and impaired cognition aspects. The reverse is true for the dysphoric state. It should be noted, however, that, despite the presence of strong dysphoric elements, e.g., jittery, tense, fear of loss of control, there still exists a moderate level of the happy, relaxed feeling, just as the moderately euphoric state contains some jitteriness. Neither of these states is, therefore, clearly euphoric or dysphoric - they only lean more strongly in these directions. On the other hand, the ambivalent state, of which there are four cases, is more euphoric and dysphoric than is either of the other two states. The ambivalent state also exceeds the other two states on almost all of the factors which mark out the specificity of the LSD reaction. In short, it appears to represent the most extreme and most emotional of the states produced, and the reaction closest to that which is usually reported as occurring under higher doses of LSD.

The pattern of the amphetamine euphoric subjects is similar to that of the moderately euphoric LSD group, but manifests less jitteriness and more feelings of control and better functioning, and seems clearly stimulated and euphoric. The small group of amphetamine dysphorics is presented only for purposes of comparison. Their dysphoria is again more consistent than that which is found in the more contradictory LSD dysphoric group. The placebo neutral group is made up of those subjects who did not receive an active drug and did not subsequently report any subjective changes.

The patterns for each state, with mean scores on all relevant scales, are presented in Table 3. The a priori scales, euphoria, dysphoria, and ambivalence,

Insert Table 3 about here

which are also included in the table, were examined after the identification of the patterns and clearly support the differentiation of the states. The total number of subjects included in the drug state comparisons is 40.[7]

Behavioral, Perceptual and Speech Correlates of Subjective States

How are these subjective states manifested in the individual's behavior, his perceptions, and his manner of communicating? We were aware that the names that were given these states were somewhat over-simplified and not entirely accurate as descriptions. Through a study of the correlates of the states, it was expected that the nature of these experiences would become clearer.

Each group in the following analysis will be compared with a placebo group which did not respond with any subjective changes. The description of the results will also emphasize comparisons among the LSD states and between the LSD and amphetamine euphoric states. The latter comparison is of special interest

because it would appear from the analysis of the subjective effects that the two states are quite similar. Yet it was clear even in that data that this similarity was very probably a superficial one.

Table 4 presents the patterns of behavior of these groups on variables

Insert Table 4 about here

derived from the set of observational rating scales. Each variable is based on one or two adjectives, rated on 4-point scales. Scores used are means of the ratings of two observers, the psychologist and psychiatrist. The variables selected are those which can be rated reliably and are relevant to the subjective states delineated. The different states were compared (with the exception of amphetamine-dysphoria) on each of these scales by means of t-tests or Fisher exact probability tests. The conclusions which can be drawn from these comparisons are limited, of course, by the size of the groups, but several things are fairly clear.

The LSD groups are more like each other in some very distinctive aspects of manifest behavior than they are like any of the other conditions, despite their differences in subjective emotional tone. They are strikingly more giggly and their moods are seen as more fluctuating and inappropriate than are any of the other states. They are also seen as cognitively less clear and generally more afraid and apprehensive. On observed happiness, however, only the euphoric and ambivalent subjects significantly exceed the placebo group. Where there might have been some difficulty in distinguishing the LSD euphoric state from the amphetamine euphoric on the basis of subjective data, it is clear that they are very different groups from the standpoint of manifest behavior. The amphetamine

group, except for the mood fluctuating variable, is not overtly very distinguishable from the placebo neutral group. Some differences in the observable behavior of the three LSD states (e.g., greater fear and suspiciousness and less clear thinking and happiness of the dysphoric subjects and greater mood fluctuation of the ambivalent subjects), although not reaching significance, are consistent with the distinction of the three subjectively different states. In general, however, although the internal states of the LSD groups appear to be quite different, the manifest behavior of these groups is not as clearly distinguishable.

When we turn to the results of the perceptual and the verbal data, the problems in analysis become more complicated. The measures are still in an experimental stage, and the small number of subjects in each group and the extent of their variability on the pre-drug scores limits the types of analyses which can be carried out. Attempts were made to take into account any differences in initial levels in interpreting results.

Only a few of the pre-drug groups means for the picture ratings were significantly different from each other. In order to partially control for these differences, change scores were used in the analysis of these results, and differences between pairs of states were evaluated by t-tests on these change scores.

When the several LSD states are compared with the placebo neutral state, as in Figure 1, it can be noted that the euphoric group appears to move in the

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Insert Figure 1 about here

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direction of perceiving others as more friendly and less hostile and suspicious.

The pattern of change is similar for the dysphoric group, but the contrast between these factors, the friendly and hostile, is less marked. The most striking changes are noted in the ambivalent group, where the subjects' tendency to move in the direction of perceiving more friendliness and more suspiciousness is quite pronounced. The extent of perceived suspiciousness is significantly greater (at .05) than that for each of the other LSD groups, and the sheer amount of change over-all is quite striking. The emotionality and the contradictoriness - that is the perceiving of both positive (friendly) and negative (suspicious) elements - is consistent with the picture presented in the subjective data.

In figure 2, the two euphoric states are compared. The amphetamine state,

Insert Figure 2 about here

although having an increase in perceived friendliness in common with the LSD condition, appears to be quite distinct in its overall pattern. There is a significantly greater decrease in perceived fearfulness as compared with placebo (at .05), and slight increases in perceived hostility and suspiciousness in contrast to the decreases noted with LSD (differences between amphetamine and LSD on hostility significant at .05). The tendency for amphetamine to result in the perception of more "aggressiveness" in the environment is something which was found in an overall comparison of the drugs in this study. The meaning of the results with the picture rating technique is not completely clear at this point, but these subjective states appear to result in relatively distinct patterns of perception (except for the LSD dysphoric) and contribute to an understanding of the various psychological states.

The speech of subjects experiencing distinctively different emotional states might also be expected to differ along a number of dimensions. The verbal samples elicited in this study have been subjected to several different types of measurement, but only three of the most relevant measures will be presented here. These are the temporal measures of amount of speech produced and rate of articulation and the vocal rating on a bipolar scale of happy-sad. The comparizon of the three LSD states and the amphetamine euphoric state on these measures is presented in Figure 3. (Although all groups were also

Insert Figure 3 about here

compared with placebo-neutral subjects, this group is not graphed, but will be mentioned where relevant.)

The happy-sad ratings are most relevant to the emotional states that were produced. The LSD-ambivalent group was the only one to move in the direction of sounding happier on drug while the LSD-dysphoric group sounded most sad (although differences were not quite significant - using t-tests between pairs of drug states - with these small N's). The amphetamine and LSD euphoric groups fell between the others, as did the placebo group, and did not differ from each other. These findings may make most sense if one thinks of the happy-sad ratings as reflecting, at least in part, the extreme stimulation and emotionality of the ambivalent group, rather than simply the usual concept of happy. The euphoric subjects, who were more quietly and less excitedly happy, were thus heard as similar to the placebo subjects on this dimension.

The interpretation of the results on the temporal measures is more complicated. Although the emotional states are differentiated in the same general way

on both of these measures in the post-drug period, they already differ markedly on these measures pre-drug. Thus, the differences one sees among the four states on these variables seem to be characteristic of the subjects who experience these states - before as well as during the actual drug experience. LSD ambivalent subjects talk a great deal and very rapidly, while LSD dysphoric subjects speak little and slowly (differences between ambivalent and dysphoric in productivity and rate significant at .05 and .01, respectively, as indicated by t-tests in both periods). Euphoric subjects again fall between. Although the meaning and correlates of productivity and rate of speech have been found to differ in different experimental situations (Mahl & Schulze, 1962), they might be thought of as reflecting amount of arousal and excitation, what has been called an "outgoing emotionality."

The results suggest that productivity and rate, differing both before and during drug, may reflect a more permanent attribute of the subjects, while the happy-sad dimension may be more responsive to transient emotional states such as those brought about by drugs. Thus, the ambivalent subjects in this study appear to be higher both in their general level of emotionality and in the increased arousal due to the drug.

Discussion

As noted in the introduction, this study was designed so that it might be possible to observe the effects of LSD in their very early stages. An understanding of how the more complicated conceptual reactions occur should be facilitated by a clearer picture of the basic psychological effects on the organism. The new methods provided a fairly comprehensive picture of the components of the response and the several emotional states which were experi-

enced by the subjects. These results will be integrated later in this section in an attempt to characterize the three states produced. The reported findings do not, however, completely document some unusual effects occurring in the early stages of the LSD reaction, which were observed in this study and which deserve comment. The nature of these unusual effects, which relate primarily to the quality of the emotional experience, contribute to an understanding of the complex psychological states which are produced.

The most striking effect was the tendency for very intense emotions to occur in some subjects without any apparent outside stimulus and, initially, without any cognitive component or counterpart, e.g., "I feel like I'm angry," - "I feel very angry - but I know that I have no reason to be, yet I'm getting angrier by the minute;" "I feel like something funny has happened," - "everything seems funny, but I don't know why." These effects have relevance to certain theoretical notions current in the field concerning whether a complete emotion can exist, or be experienced, without an appropriate cognitive counterpart. Schacter and his associates have proposed, on the basis of their research (Schachter & Singer, 1962), that it is not likely that complete emotions exist in the absence of a conceptual component; that where the subject is aware that the physiological arousal is due to a drug, he is not likely to have an "emotion." Zubin and Katz (1964) have, in reviewing further evidence on the problem, tended to support this theory. Careful observation of human subjects under LSD makes one question whether this is, in fact, the case. Several subjects experiencing the usual signs of physiological arousal associated with LSD reported what appear to be very strong emotions, prior to attaching to them any label or conceptual component and despite the fact that they were aware of the source of the arousal.

Thus, highly intense emotions, sometimes competing ones, which are initially free of situational and cognitive factors appear to be produced by LSD. These mixed emotional states, which create possibly new but confusing experiences for the subject, provide the substrate for many other things to occur in the perceptual and the cognitive spheres. This aspect of the total experience is an important one and may have implications for explaining the more elaborate mystical and conceptual reactions reported elsewhere. An attempt to integrate this quality of the experience with the other major perceptual, cognitive and sensory phenomena will be made at the end of this section. But first it is important to review how these intense and diverse emotions are subsequently defined by the subjects. The emotional states which result are, as expected from previous research with LSD, not uniform among subjects. They were effectively differentiated by the new methods employed. In characterizing these states, the findings obtained with the various methods will be integrated and the states differentiated from those produced by another somewhat similarly acting drug.

1. The <u>moderately euphoric</u> LSD state is characterized by feelings of elation, cognitive and psychomotor improvement, some feelings of jitteriness and tension, but little or no fear of loss of control. To observers, subjects in this state appear happy, giggly and a little afraid with inappropriate and fluctuating mood. Their perceptions are characterized by a tendency to see others as more friendly and less hostile, angry and suspicious. Their vocal behavior is not very different from that of placebo subjects. The elated state of the euphoric LSD subjects appears to be qualitatively different from that of the amphetamine euphoric subjects, who report feeling even more confident, relaxed and happy, see more improvement in their cognitive and psychomotor per-

formance, and report almost no jitteriness. The LSD euphoric subjects, however, appear happier to observers than the amphetamine subjects, probably due to the greater expression of emotion by the LSD subjects as seen in their laughter and fluctuating and inappropriate mood.

2. The dysphoric LSD state is characterized by feelings of jitteriness and tension, a fear of loss of control, feelings of impaired cognition and psychomotor performance, and also some seemingly contradictory feelings of relaxation and happiness. Behaviorally, these subjects appear somewhat less cognitively clear and more afraid and suspicious than other LSD subjects. Although they manifest some of the same giggliness and fluctuation of mood as do the other LSD subjects, they are seen as less happy. Their perceptions of others are similar to those of placebo subjects. Their voices sound sadder and they talk less and more slowly than do any of the other subjects. Thus, the dominant mood of fear and depression appears to override any positive feelings experienced by these subjects.

3. The ambivalent subjects are without doubt experiencing the most intense and most striking of the LSD states. On both positive and negative features, they generally report the greatest response: most relaxed, happy and sociable, but also most jittery, tense and fearful of losing control. They are seen by observers as the happiest of the subjects and as most extreme in their giggliness and fluctuating and inappropriate moods. In their perceptions they are again ambivalent, seeing both more friendliness and suspiciousness in others. Their heightened emotionality is expressed in their speech; their voices sound happier and they speak a great deal and very rapidly. The quality of the euphoria that they experience is, to an even greater extent than was true

for the LSD euphoric subjects, strikingly different from that of the amphetamine subjects. While the latter appear highly stimulated, the LSD ambivalent subjects were much more than stimulated; their strong sense of well-being, coupled with feelings of decreased control, gave rise to a state of exhilaration or marked elation. In all ways, these subjects appear most emotional and, although their elation might be the most impressive element, they tend to experience and to express strong, opposing emotions and perceptions.

This characterization of the three states highlights the differences in the direction and intensity of the emotional experiences and in the nature of cognitive and perceptual phenomena experienced by the LSD subjects. Despite these individual differences in quality and pattern of reaction, it is clear, also, from the analysis, that most of the LSD subjects experienced, to some degree, all of the basic phenomena which differentiated LSD from placebo and amphetamine. These relatively uniform effects (see Table 2) were produced in a controlled setting in which the subjects were unfamiliar with the effects of the drug and in which there was a careful and fairly successful attempt at controlling and neutralizing expectations. Given these conditions, the basic effects must be traced in major part to the drug itself. The appearance of the different patterns of response is, on the other hand, most probably related to non-drug factors.[8]

In turning to the question of how, at the height of an LSD experience, profound alterations of consciousness and elaborate conceptualizations may develop, it will be useful to review the basic phenomena shared by most LSD subjects and to consider the implications of a psychological state in which

there are:

1. Very strong but opposing emotions occurring approximately at the same time, emotions which may not have a cognitive counterpart.

2. A feeling of being out of control of one's emotions and thoughts.

3. A feeling of detachment from the real world.

4. A feeling of perceptual sharpness but at the same time perceptions of the outer world as having an unreal quality.

5. The perception of the world and others as "friendly" but "suspicious."

This assemblage of competing emotions and perceptual counterparts and the general intensity of the reaction would appear to create a very bizarre experience for most individuals in our culture to undergo - and one which may not easily be assimilated or integrated into their previous experience.

It raises the question much considered in the past in psychology of how human beings actually come to terms with new, strange, highly-charged experiences. Frederick Bartlett's theory (1932) held that when human beings are confronted with experiences which are not comprehensible to them in terms of previous experience, they are driven to find meaning, sometimes any meaning - and the more awesome the experience, the more quickly they will evolve some rational construction.

In such a context, it seems reasonable to expect that non-drug factors - setting, suggestion, previous experience, "personality" - would come into play and help to shape the final pattern of response. Although these non-drug factors are thus likely to contribute to the meaning which is finally attributed to the experience, the elements of the new experience seem to be largely due to the unusual effects of the drug itself.

One of the most dominant aspects of the experience then, appears to be the contradictoriness and intensity of the basic somatic, emotional and perceptual effects which occur in the early stages of the LSD reaction. This ambivalent emotional and perceptual state might very well provide the basis for similar paradoxical phenomena which have been reported to occur later at the conceptual level. Although this sequence of effects does not completely explain the bases for the profound and paradoxical states of consciousness which have been described so vividly in the literature, it may contribute to our understanding of where and how these very unusual experiences begin.

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Footnotes

1. Based on a paper presented at the Symposium, "The Use of Psychotomimetic Agents as Treatments in Psychiatry, Including Relevant Basic Research on the Effects of Such Drugs in Man," at the Meetings of the Collegium Internationale Neuropsychopharmacologicum, Washington, D. C., March 28-31, 1966. The research was carried out at the Patuxent Institution, Jessup, Maryland. The authors gratefully acknowledge the cooperation and support of Dr. Harold Boslow, Director of the Institution, Dr. Richard Kastner, former Research Director, and staff members of the Psychology and Psychiatry Departments, who participated in the study.

2. The use of chlorpromazine is related to the method development aims of the project and these results will not be reported here.

3. The authors gratefully acknowledge the assistance and consultation of B. K. Radhakrishnan, Biometric Laboratory, George Washington University, in providing the modified computer program for this analysis.

4. A more detailed description of the development of this technique is in preparation.

5. The subject received a score of one on the ambivalence scale each time he endorsed two apparently contradictory items, e.g., feeling relaxed and tense; head feeling heavy and light.

6. These scales were comprised of more items than the specific scales and, as would be expected, provided more range and more dis-

Footnotes (continued)

crimination among subjects.

7. The 2 LSD and 12 amphetamine subjects omitted from this analysis had such mild or indistinct reactions that they could not be categorized into drug states; there were, e.g., no clearly dysphoric amphetamine subjects in Study 2. Placebo subjects who had even mild reactions were excluded from the drug state comparisons, since the purpose of including a placebo group in the analysis was to provide a "neutral" control against which the characteristics of the emotional states could be contrasted.

8. The relationship of personality variables to drug response will be dealt with in another paper.

Subjective Drug Effects Questionnaire

I. Empirical Scales: Based on Cluster Analysis of Items

General Response Scales

A. Cognitive and Psychomotor

1. Improved: thinking enhanced, speech and movements quickened, and time sense improved (12)[a]
2. Impaired: thinking impaired, movements slowed, time sense altered (7)

B. Bodily and Feeling

3. Relaxed, happy, light, controlled (12)
4. Jittery, tense, hard to talk, less controlled (11)

C Control

5. Fear of loss of control (7)
6. Feelings of increased control and good functioning (5)

Specific Scales

D. Feelings

7. Dizzy, excited, silly (5)
8. Dream-like, floating (4)
9. Dreamy, giddy (5)
10. Upset, unhappy, asocial (5)
11. Sober, serious (3)
12. Peaceful, sociable (3)

E. Perceptual

13. Sensory and perceptual sharpness (6)
14. Detachment and unreal quality to perceptions (6)
15. Altered perception of self and others (3)

F. Somatic

16. Weak, sick (6)
17. Sluggish, stuffy, feeling of pressure (7)
18. Sympathetic arousal and increased sensitivity (6)
19. Parasympathetic arousal (4)

II. A Priori Scales: Based on Hypothesized Effects of Drugs

20. Increased awareness(6)
21. Decreased awareness (6)
22. Increased control (3)
23. Decreased control (7)
24. Ambivalence (67)
25. Euphoria (34)
26. Dysphoria (47)

[a]Number of items is in parentheses

Table 2

Comparing LSD to Amphetamine and Placebo
on the Subjective Drug Effects Questionnaire[a]

I. LSD> Placebo

More Significant**

2. Impaired cognitive and psychomotor functioning
3. Relaxed, happy, light, controlled
4. Jittery, tense, hard to talk, less controlled
7. Dizzy, excited, silly
8. Dream-like, floating
9. Dreamy, giddy
14. Detachment and unreal quality to perceptions
15. Altered perception of self and others
18. Sympathetic arousal and increased sensitivity
26. Dysphoria

Less Significant*

5. Fear of loss of control
13. Sensory and perceptual sharpness
16. Weak, sick
17. Sluggish, stuffy, feeling of pressure
20. Increased awareness
21. Decreased awareness
23. Decreased control
25. Euphoria
24. Ambivalence[b]

II. LSD Not Significantly Different From Amphetamine in Either Period[c]

1. Improved cognitive and psychomotor functioning
3. Relaxed, happy, light, controlled
6. Feelings of increased control and good functioning
13. Sensory and perceptual sharpness
20. Increased awareness

III. Amphetamine >LSD*

22. Increased control

*.05 in at least one post-drug period.
**.01 in at least one post-drug period.
[a]Univariate analyses at 1½ hours and 3½ hours (N=33, Study 1 only).
[b]Based on analysis of frequency with which it occurred throughout the day.
[c] LSD significantly exceeds Amphetamine in at least one period on scales in I which are not included in II, with the exceptions of Euphoria and Dysphoria.

Table 3

Subjective States Produced by LSD, Amphetamine, and Placebo:

Patterns of Response on the Subjective Drug Effects Questionnaire

Treatment	Subjective State	n	Mean Scores on Dimensions used for Identifying Patterns: Improved Cognition	Relaxed, Happy	Peaceful, Sociable	Impaired Cognition	Jittery, Tense	Fear Loss Control	A Priori Scales: Eupho-ria	Dyspho-ria	Ambiva-lence
LSD	Moderately Euphoric	8	5.25	7.38	2.13	2.63	2.25	.88	41.51	11.89	3.34
	Dysphoric	9	2.33	5.44	.89	5.00	7.33	4.00	18.98	38.48	7.12
	Ambivalent	4	7.25	7.50	3.00	4.50	8.00	4.25	46.11	40.03	20.97
Amphetamine	Stimulated or Euphoric	8	9.00	10.13	2.63	2.63	1.00	.88	54.78	12.77	5.80
	Dysphoric	3	.67	.67	.67	2.67	5.33	2.00	4.92	26.59	.45
Placebo	Neutral	8	.13	.63	.00	.38	.38	.25	3.64	5.87	.00

Table 4

Subjective States Produced by LSD, Amphetamine, and Placebo:

Patterns of Observed Behavior

Treatment	Subjective States	n	Clear-thinking[a]	Happy[a]	Afraid, Apprehensive[b]	Suspicious[b]	Giggly[a]	Mood Fluctuating[a]	Mood Inappropriate
LSD	Moderately Euphoric	8	45.00**	52.50*	33.75*	35.00	47.50**	41.25**	47.50**
	Dysphoric	9	37.22**	41.12	38.88**	38.88	42.44**	40.00**	38.88**
	Ambivalent	4	46.25	55.00*	33.75	32.50	52.50**	52.50**	52.50**
Amphetamine	Stimulated or Euphoric	8	50.62	45.00	31.25	27.50	23.75/	27.50*/	21.25/
	Dysphoric	3	53.33	33.33	38.33	33.33	23.33	30.00	30.00
Placebo	Neutral	8	53.10	35.00	25.00	27.50	22.50	21.25	21.25

*Significantly different from the placebo condition at the .05 level.
**Significantly different from the placebo condition at the .01 level.
/Significantly different from the LSD euphoric condition at the .01 level.
[a]Observations made at ca. 2¼ hours post-drug.
[b]Observations made at ca. 1¼ hours post-drug.

Fig. 1. The three LSD states and the placebo-neutral state: patterns on Picture Rating variables.

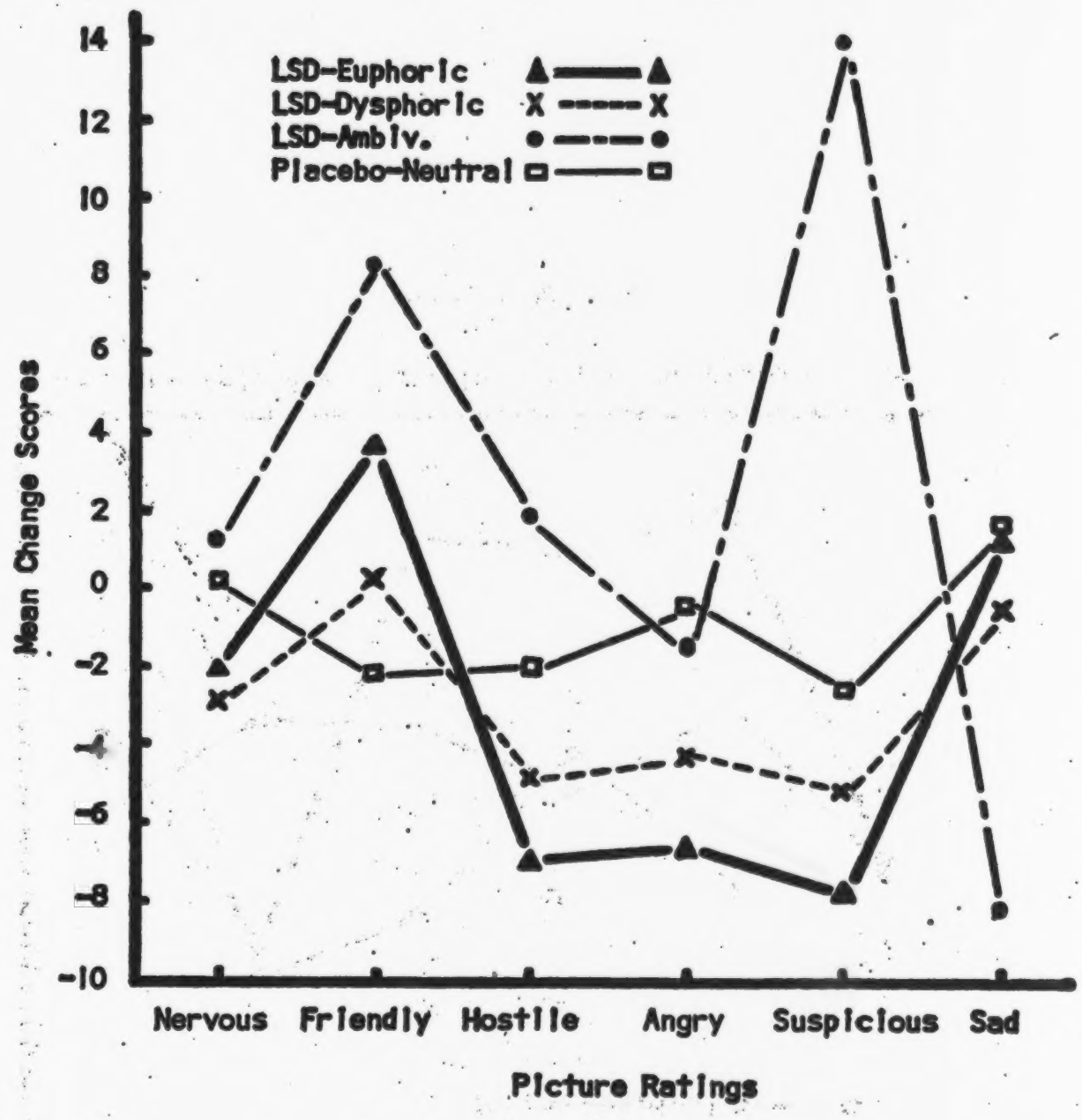
Fig. 2. The two euphoric states and the neutral state: patterns on Picture Rating variables.

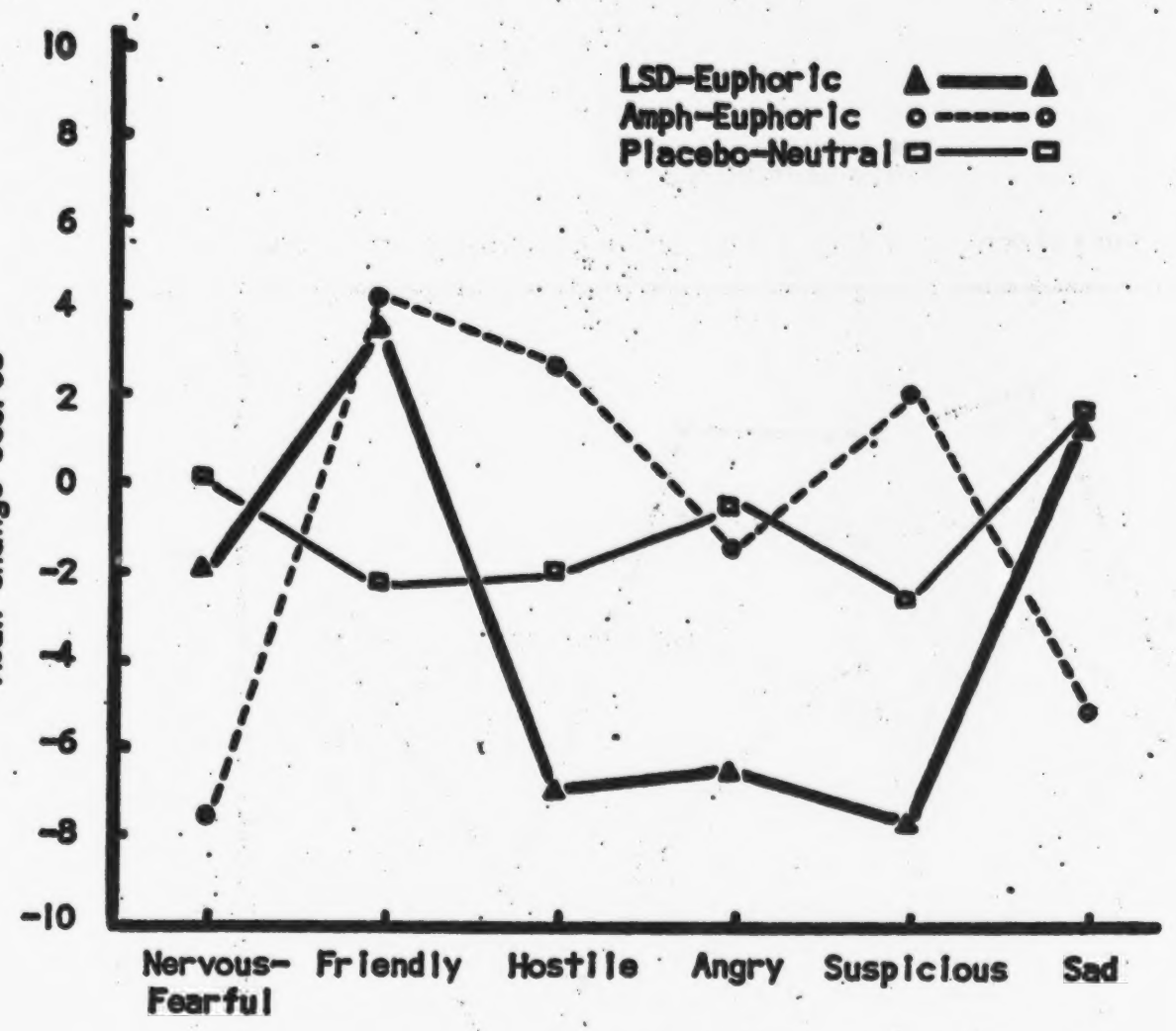
Fig. 3. Subjective states produced by LSD and amphetamine: Speech measures.

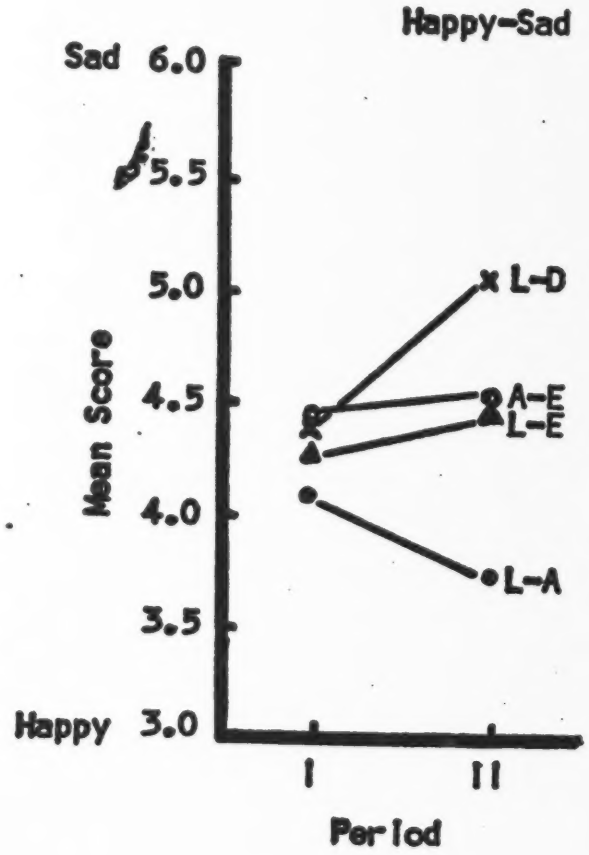
Note 1. L-E: LSD euphoric; L-D: LSD Dysphoric; L-A: LSD Ambivalent; A-E: Amphetamine Euphoric.

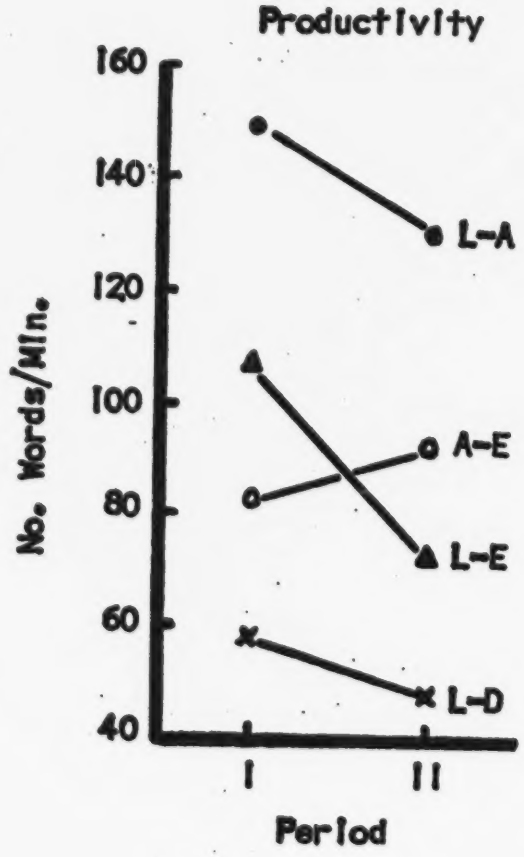
Note 2. Period I is pre-drug; period II is about 2 hours post-drug.

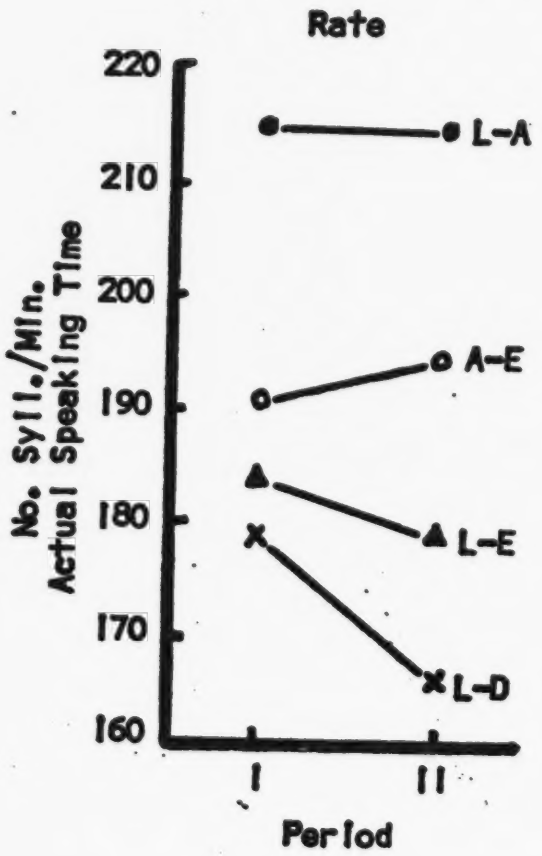
Note 3. N for L-A = 4; N for the remaining states varies between 6 and 9.


LSD-Euphoric
LSD-Dysphoric
LSD-Ambiv.
Placebo-Neutral
Mean Change Scores
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
Nervous
Friendly
Hostile
Angry
Suspicious
Sad
Picture Ratings


LSD-Euphoric
Amph-Euphoric
Placebo-Neutral
Mean Change Scores
10
8
6
4
2
0
-2
-4
-6
-8
-10
Nervous-Fearful
Friendly
Hostile
Angry
Suspicious
Sad
Picture Ratings


Happy-Sad
Sad
Happy
Mean Score
6.0
5.5
5.0
4.5
4.0
3.5
3.0
L-D
A-E
L-E
L-A
I
II
Period


Productivity
No. Words/Min.
160
140
120
100
80
60
40
L-A
A-E
L-E
L-D
I
II
Period


Rate
No. Syll./Min.
Actual Speaking Time
220
210
200
190
180
170
160
L-A
A-E
L-E
L-D
I
II
Period